

Tiny Basic pps

②

Hyper tape pps 12

Kim-1/6502 POWER!

If you think that KIM-1 with 1K RAM is a limited power machine -- hold on to your hat! Peter Jennings has written a chess-playing program that runs in 1K using just the keyboard and display. I've played against his current version, which plays at the 'competent beginner' level. Even this is quite impressive, but Peter tells me that he'll be beefing up the strategy over the next few months and expects it to play a fairly competent game. All this in 1K! Never underestimate your KIM.

Peter plans to market his chess program commercially after he polishes it up in the next few months ... I'm looking forward to seeing the final version.

--Jim Butterfield

Kim-1 USER NOTES
C/O ERIC C. REHNKE
425 MEADOW LANE
SEVEN HILLS, OHIO
44131

FIRST
CLASS

Kim-1/6502 USER NOTES

NOVEMBER 1976

VOLUME 1 ISSUE 2

PAGE 1

As of now we have 470 members...and plenty of new ideas to develop. But first, we have some corrections for volume 1 issue 1.

Page 4 - the second instruction in the random number generator should be SEC not (SED)

Page 13 - bottom portion of listing should read:

027A	C8
027B	CO 06
027D	90 F3
027F	20 3D 1F
0282	60

Page 16 - top address should read 005B (not 005E), address 0091 should contain C9 15 (not 09 15)

Page 18 - address 0238 should be D0 (not DC)
address 0242 should be D8 (not DB)

To alleviate possible typographical errors in future issues, please try to submit articles single spaced on white bond so that we may cut and paste instead of re-typing. Also, if you expect a personal response to correspondence, please include a self addressed stamped envelope, to help defray expenses.

MOS KIMATH PACKAGE PRELIMINARY

Let's hold off from interfacing calculator chips to our 6502's - at least for a while. I just received preliminary documentation from MOS Technology for a floating-point package (up to 17 digits and exponents from +99 to -99) that may be what we need for adding higher math functions to our machines. It's a 2K X 8 ROM with routines for ADD, SUBTRACT, MULTIPLY, DIVIDE, SQUARE ROOT, LOG, ANTILOG, TANGENT, and ARCTANGENT, in 4 different formats. KIMATH also has several subroutines for evaluating polynomial expressions which can be used to approximate most other mathematical functions.

The price and availability are not known at this time and will be passed along when released from MOS.

RAMS!!!

Have you seen the October issue of BYTE?

The theme of the issue was morse code interpretation and several different methods were presented. This application is a natural for the KIM! (with suitable I/O). The article on page 36 showed, perhaps, the most logical and easiest to implement form of morse code handling (I will be using this algorithm). There were also several audio
Con't.

ALREADY
CORRECTED
IN #1

to digital conversion circuits using the 567 tone decoder that looked promising.

I am quite excited over the possibility of combining two of my hobbies in this manner and will be spending alot of energy in this area. I know that some of you are also working on this application, so let's hear from you.

If we can get a workable program together - we may be able to interest MOS Technology into masking off a ROM (2K x 8). There might be room for a BAUDOT RTTY program also (ON ONE CHIP!).

MORE USER GROUPS GETTING STARTED

STANTON, CALIFORNIA - Daniel Gardner, 11825 Beach Blvd., Stanton, Cal. 90680
Phone - 714-898-7264

TORONTO, CANADA - Peter R. Jennings, 1612-43 Thorncliffe Pk. Dr., Toronto,
Ontario, Canada M4H 1J4 Phone 416-423-8263 or 678-1363

HOUSTON, TEXAS - Jeff Campbell Phone 464-6571

THE OTHER TIMER

by Richard W. Lutz

Need a second interval timer? Your KIM system has one in the 6530-002 that is used only when loading or dumping to audio cassette. In applications where possibly you have dedicated your "application" Timer (address 1704-170F) to a real time clock and you may still need to time intervals or incorporate delays, the other timer is available instead of using software timing loops. However, the timer has to be poled (BIT Test) rather than run on an interrupt basis as PB-7 on 6530-002 is used for the audio cassette interface.

Addresses of The "Other Timer":

1744 = Divide by 1 Time
1745 = Divide by 8 Time
1746 = Divide by 64 Time
1747 = Divide by 1024 Time
1747 = Read Time Out Bit (Bit Test)
1746 = Read Time

Want your program in firmware? Richard is offering to program EPROMS with your program. He also has a circuit board available (with buffered address lines) that will accept the PROM and a 6530. For details, drop him a post card.

122 Carol Street
Carrboro, North Carolina 27510

Here's a tip that may help other beginners with the KIM-1. In order for the single step SST switch to work, it is necessary to load the interrupt vector: 1C00 into location 17FA & 17FB 17FA (00) 17FB (1C)

I didn't know this--the manual isn't clear--and I sent my computer back to MOS Tech. for repairs.

EMBARRASSED

PAGE 2

RELATIVE BRANCH TABLE
6502 and 6800

by Fred Crawford Jr.
2152 Carolina Dr. NE
Cedar Rapids, Iowa
52402

BACKWARD RELATIVE

8 -	128	127	126	125	124	123	122	121	120	119	118	117	116	115	114	113
9 -	112	111	110	109	108	107	106	105	104	103	102	101	100	99	98	97
A -	96	95	94	93	92	91	90	89	88	87	86	85	84	83	82	81
B -	80	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65
C -	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49
D -	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
E -	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
F -	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

0 1 2 3 4 5 6 7 8 9 A B C D E F

0 -	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1 -	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
2 -	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47
3 -	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
4 -	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79
5 -	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95
6 -	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111
7 -	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127

FORWARD RELATIVE

MODIFYING THE S.D. SALES 4K LOW-POWER RAM BOARD
FOR USE WITH KIM

from Robert E. Haas
2288 Blackburn St.
Eugene, Or. 97405

My KIM-1 system currently has an additional 8K of RAM and a 16-line by 64-character video display of my own design plus an ASCII keyboard. One of the two 4K memory boards in my system is a modified S.D. Sales Altair-compatible board. My first contribution to the newsletter is the enclosed article detailing the modifications I made to the S.D. Sales board. The neophyte KIM owner should probably not attempt to perform such a modification, but a more knowledgeable user who is looking for a low-cost memory, but up to now has not had the confidence to purchase an Altair-compatible board, will be interested.

I am writing an assembler for the 6502 which will use a modified version of the KIM cassette I/O protocol for source input and object output. I have added start-stop control via peripheral pins and can read and write individual records on cassette tape. The process is slow but cheap and reliable. I would like to distribute the assembler through the User's Group when it is finished. I will make it easy for a user to integrate his own video or hard-copy output into it.

I am happy that a KIM/6502 User's Group has been started. I would like to see an end to the dominance of the hobby computer field by Altair and friends.

Com't.

The modifications described here do not require any damage or physical changes to the board (trace cut) so the board can be restored to, and retain resale value as, an Altair-compatible board. The modification proceeds as follows:

1. Solder all components on the board per the instructions. Do not insert any IC's into sockets yet. (Do solder the regulators on the board).
2. Install jumpers in the memory-address-selection area between a-a, b-b, c-c, and d-d.
3. Using a short piece of small-diameter bare wire (such as #30 wirewrap wire, stripped) tack a jumper between IC-34 pins 6, 9, and 10. Tack a similar jumper between IC-39 pins 2 and 3.
4. Using insulated wire tack a jumper between IC-34 pins 12 and 13 and IC-39 pin 4. Tack a jumper between IC-34 pin 8 and IC-39 pin 6.
5. Tack four insulated-wire jumpers between the following pins of IC's 37 and 33: IC-37 pins 13, 11, 9, and 5 to IC-33 pins 3, 8, 11, and 6, respectively.
6. Tack-solder four 560-ohm, 1/4w resistors between +5 volts (found at IC-34 and IC-37 pin 14) and IC-34 pins 1, 2, 4, and 5.
7. Insert the 21102's and IC-34, a 74S20, and IC's 38, 40, 41, 42, and 43 (8797's). IC's 33, 35, 36, 37, and 39 are not used, and must be omitted.

Modification is complete and connection between KIM and the memory board should be made via an Altair-style 100-pin connector. The connections are as follows:

n/c Expansion connector

pin A (A30)
pin B (A31)
pin C (A32)
pin D (A33)
pin E (A34)
pin F (A35)
pin H (A36)
pin J (A37)
pin K (A38)
pin L (A39)

pin Z (RAM-R/W)
pin V (R/A)

pin P (DB7)
pin 9 (DB6)
pin 10 (DB5)
pin 11 (DB4)
pin 12 (DB3)
pin 13 (DB2)
pin 14 (DB1)
pin 15 (DB0)

KIM Application connector

pin C (K1)
pin D (K2)
pin E (K3)
pin F (K4)

Memory board conn.

pin 79
pin 80
pin 81
pin 31
pin 30
pin 29
pin 22
pin 83
pin 84
pin 34

pin 68
pin 47

pins 43 and 90
pins 40 and 93
pins 39 and 92
pins 38 and 91
pins 42 and 89
pins 41 and 88
pins 35 and 94
pins 36 and 95

pin 33
pin 85
pin 86
pin 32

Con't.

System ground must be connected to memory board pins 50 and 100 and a source of +5 volts unregulated to memory board pins 1 and 51. The board draws about 1 ampere.

The 8T97 buffers used on the memory present a fraction of a TTL load to the KIM, therefore no other buffers are required. Of course, if additional devices are connected to the KIM, buffers will be required.

TIMER

by Joel Swank #186
4655 S. W. 142nd
Beaverton, Ore. 97005

TIMER turns KIM into a digital stopwatch showing up to 99 minutes and 59.99 seconds. It is designed to be accurate to 50 microseconds per second. The interval time is used to count 9984 cycles and the instructions between the time out and the reset of the timer make up the other 16 cycles in .01 seconds. The keyboard is used to control the routine as follows:

KEY	FUNCTION
0	stop
1	go
2	reset
3	print time on terminal
4	return to KIM

TIMER

0320		TIMER	*=0320	
0320 A9 00	RESET	LDA #0		
0322 85 F9		STA INH		zero display
0324 85 FA		STA POINTL		
0326 85 FB		STA POINTH		
0328 20 1F 1F	HOLD	JSR SCANDS		light display
032B 20 6A 1F		JSR GETKEY		read keyboard
032E C9 04		CMF #4		key 4
0330 D0 03		BNE NOQUIT		
0332 4C 6A 1C		JMP CLEAR		return to kim
0335 C9 03	NOQUIT	CMF #3		key 3
0337 D0 1F		BNE NOPRT		
0339 A5 FB		LDA POINTH		
033B 20 3B 1E		JSR PRTHYT		print value
033E A9 3A		LDA #1		on terminal
0340 20 A0 1E		JSR OUTCH		
0343 A5 FA		LDA POINTL		
0345 20 3B 1E		JSR PRTHYT		
0348 A9 2E		LDA #1		
034A 20 A0 1E		JSR OUTCH		
034D A5 F9		LDA INH		
034F 20 3B 1E		JSR PRTHYT		
0352 20 2F 1E		JSR CHLF		
0355 38		SEC		
0356 B0 D0		BCS HOLD		
0358 C9 02	NOPRT	CMF #2		key 2
035A F0 C4		BHQ RESET		back to zero
035C 09 01		CMF #1		key 1

MEMORY EXPANSION: Error in Diagnostic
The Kim-2/Kim-3 Users Manual (publication 6500-16) contains a diagnostic program to test memory on page 17 (program 2). Due to a mistake in coding, it won't work. Label 'LOOP' is placed wrongly ... it should be on the previous line. To correct, change location 0265 from value 0C given by the listing to value 09 which will give proper operation. By the way, it's not a very good diagnostic. In my opinion, let's see some better ones in USER NOTES Jim Butterfield

Con't.

0352 00 C8	BNE HCLD	
0360 A9 9C	LDA #89C	
0362 8D 06 17	STA TIMSET	set timer
0365 20 1F 1F	JSR SCANDS	display value
0368 AD 07 17	LDA TIMGET	check timer
0368 FD FB	BEQ EXCHK	wait loop
036D 8D 00 1C	STA HCN	delay 4 usec
0370 A9 9C	LDA #89C	set timer
0372 8D 06 17	STA TIMSET	
0375 18	CLC	set flags
0376 F8	JED	
0377 A5 F9	LDA INH	
0379 69 01	ADC #1	increment hundredths
037B 85 F9	LDA INH	
037D A5 FA	LDA POINTL	
037F 69 00	ADC #0	increment seconds
0381 85 FA	STA POINTL	
0383 C9 60	CMR #60	stop at 60
0385 D0 0B	BNE CKEY	
0387 A9 00	LDA #0	
0389 85 FA	STA POINTL	zero seconds
038B A5 FB	LDA POINTH	
038D 18	CLC	
038E 69 01	ADC #1	increment minutes
0390 85 FB	STA POINTH	
0392 D8	CLD	
0393 20 6A 1F	JSR GETKEY	read keyboard
0396 C9 00	CMR #0	key 0
0398 D0 CB	BNE DISPL	
039A FD 8C	BEQ HCLD	stop

Programs for the 6502 can often be found in Dr. Dobbs's Journal of Computer Calisthenics & Orthodontia. A year's subscription is \$10 to Box 310, Menlo Park CA 94025. The August 1976 issue contains a full set of floating point routines (including 10varithms but not trig functions). September 1976 has a 'disassembler'. You'll need to do a little modifying since programs are often written for other monitors (like APPLE or JOLT).

TINY BASIC NOW AVAILABLE ON KIM CASSETTE

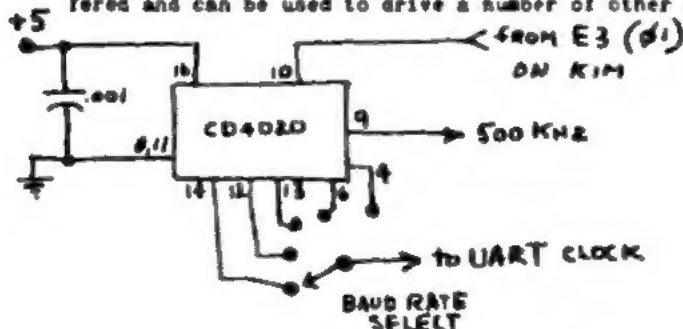
from Bob Grater

Bob Grater has informed me that the Byte Shop #2 will be making Tom Pittman's Tiny Basic available on KIM compatible cassettes for \$9.50 + \$1.00 shipping. The user manual is included in the deal.

(BASIC STARTS AT \$0200) (NOT \$2000)

Also from Bob...The SAB-1 (serial adapter board) will be available for \$24.95 + \$1.00 shipping from: Byte Shop #2, 3400 W. El Camino Real, Santa Clara, Cal. 95051.

We will have it set up at the Byte Shop #2, so that KIM users in the Bay Area can bring their KIM-1 in and play it thru our TVT to see how the system works. Also included a simple circuit that I use to clock the UART off of #1 on KIM instead of the on-board clock---this makes a super stable clock. All the CD-4020 outputs are buffered and can be used to drive a number of other accessory circuits.



FREQ. AVAILABLE	
#9 =	500 KHZ
#7 =	62.5 KHZ
#5 =	31.25 KHZ
#4 =	15.625 KHZ
#3 =	7812.5 HZ
#2 =	3906.25 HZ
#1 =	1953.1 HZ
#14 =	976.6 HZ
#15 =	488.3 HZ
#1 =	244.1 HZ
#3 =	122 HZ
#1 =	61.03 HZ

$$\text{BAUD RATE} = \frac{\text{Clock Freq.}}{16}$$

NOTE: Some members have reported that they are having difficulties getting the following Kluge Harp to run correctly. ~ the editor ~

KIM-1 KLUGE HARP

from Robert G. Lloyd
7554 Southgate Rd.
Fayetteville, N.C.
28304
(919) 867-5822

I am sending a program for A KLUGE HARP (OCT 75, BYTE, PAGE 14)

ADDRESS	MACHINE CODE	LABELS	MNEMONICS	COMMENTS
0300	A0 FF	MUSIC	LDT #8FF	
02	A9 00	LOOP2	LDA #800	
04	8D 03 17		STA PBDD	
07	EE 03 03		INC	
0A	A9 80		LDA #880	
0C	8D 01 17		STA PADD	
0F	EE 0B 03		INC	
12	EE 0B 03		INC	
15	A2 02	NOTER	LDX #802	
17	CA	LOOP1	DEX	
18	DO FD		BNE LOOP1	
1A	88		DEY	
1B	DO E5		BNE LOOP2	
1D	A5 00	SCORE	LDA #800	IN 0 PAGE
1F	8D 16 03		STA NOTER	
22	EE 1E 03		INC	
25	A2 FF		LDX #8FF	SET LOOP COUNTER FOR
27	A0 FF	LOOP4	LDT #8FF	SPEED OF MUSIC
29	88	LOOP3	DEY	
2A	DO FD		BNE LOOP3	
2C	CA		DEX	
2D	DO FB		BNE LOOP4	
2F	C5 30		CMP #830	SET FOR END OF SONG
31	DO CF		BNE LOOP2	
33	A9 00		LDA #800	RESET LOC
35	8D 1E 03		STA	031E TO 00
38	A9 02		LDA #802	RESET LOC
3A	8D 16 03		STA	0316 TO 02
3D	4C DC 1C		JMP PCCMD	EXIT DISPLAY PC

THE SCORE START IS SET AT ADDRESS 031E

THE SCORE END IS SET AT ADDRESS 0330

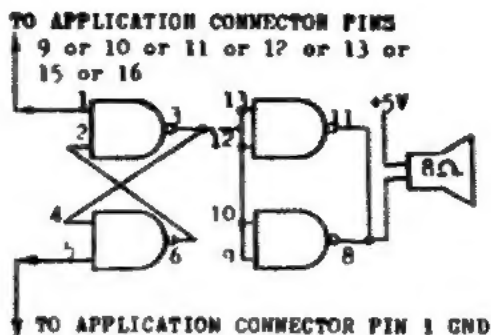
THE SCORE IS LOCATED IN "0" PAGE

TWINKLE, TWINKLE, LITTLE STAR SET LOC 031E TO 00, SET LOC 0330 TO 30

```
0000 02 02 02 55 55 39 39 33 33 39
      40 40 45 45 4C 4C 55 39 39 40
      40 45 45 55 39 39 40 40 45 45
      55 55 55 39 33 33 39 40 40 45
002B 45 4C 4C 55 02 02 02
```

DAISY SET LOC 031E to 00, SET LOC 0330 to 63

```
0000 02 02 02 1C 1C 1C 22 22 22 2B
      2B 2B 39 39 39 33 2D 2B 53 33
      2B 39 39 39 39 39 39 26 26 26
      1C 1C 1C 22 22 22 2B 2B 2B 33
      2D 2B 26 26 22 26 26 26 26 26
      22 20 22 26 1C 1C 22 26 2B 2B
      2B 2B 26 22 22 2B 33 33 2B 33
      39 39 39 39 39 2B 2B 22 26 26
      39 2B 2B 22 26 22 20 1C 22 2B
005A 26 26 39 2B 2B 2B 2B 02 02 02
```

I am trying to get a club started in the FAYETTEVILLE area. We only have 5 members right now.

HEX CODES FOR NOTES

<u>LOW OCTAVE</u>		<u>MIDDLE OCTAVE</u>		<u>HIGH OCTAVE</u>	
C	AA	C	55	C	28
C#	AO	C#	50	C#	28
D	9B	D	4C	D	26
D#	90	D#	48	D#	24
E	89	E	45	E	22
F	80	F	40	F	20
F#	7A	F#	3D	F#	1E
G	72	G	39	G	1C
G#	6C	G#	36	G#	1B
A	66	A	33	A	19
A#	60	A#	30	A#	18
B	5A	B	2D	B	16
				C	15

KEEP UP THE GOOD WORK

Yours truly,
[Signature]
ROBERT C. LLOYD

ANOTHER XIN-1 APPLICATION IDEA

AN AUTOMATED PROM PROGRAMMER can be set up to program fusible-link types (82S123, 82S129 etc.) or the erasable variety (1702A, 5204 etc.) Will save many hours of time doing a job that your computer does alot better. Who'll be the first to get this together?

A NOTE FROM WILLIAM H. DEAZLEY, 1320 Blood Road, Cowlesville, NY 14037

The KIM-1 USER'S MANUAL, page 36, last line, states that RAM locations 17C0 to 17E6 are available for application programs; however 17E7, 17E8, 17E9, 17EA and 17EB are used for CHK1, CHK2, SAVX, SAVX and SAVX respectively (see page 3 of 6530-003 software list). Therefore application programs should not use those locations and the last line on page 36 of the KIM-1 USER'S MANUAL should be changed to: ".....RAM from 17C0 to 17E6".

HUNT THE WUMPUS

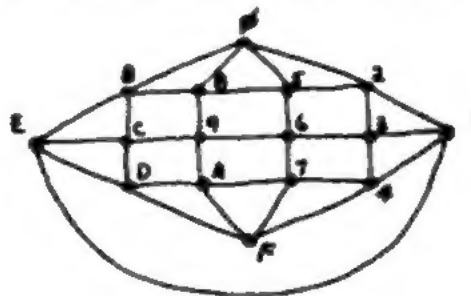
GAME BY GREGORY YOB
ADAPTED FOR THE KIM-1 BY STAN OCKERS

Stan Ockers
R.N. #4 Box 209
Lockport, Ill. 60441

I first ran across the WUMPUS in THE BEST OF CREATIVE COMPUTING where it is programmed in basic. The following is based on this program with modifications so I could fit the program and messages in the KIM-1 memory. The messages appear on the display in scanning form with "sort-of" alphanumeric letters.

The WUMPUS lives in a cave of 16 rooms (labeled S-F). Each room has four tunnels leading to other rooms (see the figure). When the program is started, you and the WUMPUS are placed at random. Also placed at random are two bottomless pits (they don't bother the WUMPUS, he has sucker-type feet) and two rooms with SUPERBATS, (also no trouble to the WUMPUS, he's too heavy). If you enter a room with a pit, you fall in and lose. If you enter a Bats' room you are picked up and flown at random to another room. You will be warned when Bats, Pits or the WUMPUS are nearby. If you enter the room with the WUMPUS, he wakes and either moves to an adjacent room or just eats you up (you lose). In order to capture the WUMPUS you have three cans of "MOOD CHANGE" Gas. When thrown into a room containing the WUMPUS the gas causes him to turn from a vicious snarling beast into a meek and loveable creature. He will even come out and give you a hug. Beware though, once you toss a can of gas in the room it is contaminated and you cannot enter or the gas will turn you into a beast (you lose).

The program starts at #300. If you lose and want everything to remain the same, (except the room you are in), restart at #316. Use the reset key to stop the program because about half of page one is used and if you just use the stop button the stack will eventually work its way down into the program. The byte at #229 controls the speed of the display. Once you get use to the characters you can speed things up by putting in a lower number. The message normally given tells you what room you are in and what the choices are for the next room. In order to fire the mood gas press PC (Pitch Can?) when the rooms to be selected are displayed. Then indicate the room into which you want to pitch the can. It takes a fresh can to get the WUMPUS (he may move into a room already gassed). GOOD HUNTING!



CAVE MAP

```
0000 80 EE DC BE 80 F7 D0 F9 80 84 D4 80 xx 80 C0 80
0010 F8 BE D4 D4 F9 B8 ED 80 B8 F9 F7 BE 80 F8 DC 80
0020 xx xx xx xx 80 00 80 DC DC F3 ED 80 C0 80 FC BE
0030 B7 F3 F9 DE 80 F7 80 9C BE B7 F3 BE ED 80 80 00
0040 -- -- -- -- -- -- -- -- -- -- -- -- -- --
0050 02 02 00 01 01 00 03 04 00 06 07 00 09 0A 01 04
0060 05 03 01 02 03 02 05 06 05 08 09 08 0B 0C 0B 07
0070 08 04 03 04 07 06 07 0A 09 0A 0F 0C 0D 0E 0C 0A
0080 0B 0E 05 06 0F 08 09 0F 0B 0C 0D 0E 0E 0F 0D 0D
0090 80 B7 84 ED ED F9 DE 80 C0 80 DC D4 B8 EE 80 xx
00A0 80 B9 F7 D4 ED 80 B8 F9 F1 F8 80 00 80 EE DC BE
00B0 80 B8 DC ED F9 80 00 80 D0 DC DC B7 D3 80 00 xx
```

```

0100 80 9C BE B7 F3 BE ED 80 B9 B8 DC FD F9 00 80 F3
0110 84 F8 80 B9 B8 DC ED F9 00 80 FC F7 F8 ED 80 B9
0120 B8 DC ED F9 80 00 80 F6 F7 80 F6 F7 80 9C BE B7
0130 F3 BE ED 80 BD DC F8 30 EE DC BE 80 00 80 ED BE
0140 F3 F9 D0 FC F7 F8 80 ED D4 F7 F8 B9 F6 80 00 80
0150 EE EE 84 84 F9 F9 F9 80 F1 F9 B8 B8 80 84 D4 80
0160 F3 84 F8 80 00 80 BD F7 ED 80 84 D4 80 D0 DC DC
0170 B7 80 00 80 DC BE F8 80 DC F1 80 80 F7 ED 80 00

0200 84 DE 85 D0 A9 07 85 3F A0 05 A2 05 B1 D0 C9 00
0210 D0 01 60 95 E8 88 CA 10 F3 D8 18 98 65 DF 85 DC
0220 20 28 02 A4 DC 4C 0A 02 A2 0A 6 DB A9 52 8C 07
0230 17 20 3E 02 2C 07 17 10 F8 C6 08 D0 EF 60 A9 7F
0240 8D 41 17 A0 00 A2 09 B9 E8 00 84 F1 20 4E 1F C8
0250 C0 06 90 F3 20 3D 1F 60 20 8C 1E 20 3E 02 D0 F8
0260 20 3E 02 F0 F8 20 3E 02 F0 F6 20 6A 1F C9 15 10
0270 E7 60 A5 C0 D0 04 L6 C0 00 F8 29 8E F0 05 0A 90
0280 F0 F0 05 06 D0 A5 C0 60 06 C0 E6 40 A5 C0 60 A2
0290 04 D5 CB F0 03 CA 10 F9 60 20 72 02 29 0F C9 04
02A0 30 D0 20 B2 02 A0 06 17 29 03 A1 B5 C6 85 CB A5
02B0 CB 60 A6 CA B5 50 95 C6 B5 60 95 C7 B5 70 85 C8
02C0 B5 80 85 C9 60 A2 03 05 C6 F0 03 CA 10 F9 60 A0
02D0 01 20 00 02 A0 00 A9 AC 20 00 02 4C D4 02 B0 D0
02E0 F3 F7 F8 20 80 EE JC BE 80 BD F9 F8 80 F7 80 F6
02F0 BE BD 80 F1 D0 DC H7 80 9C FE B7 F3 BE ED 80 00

0300 AD 06 17 85 30 A7 3F A2 0E 95 C1 3A 10 FB A9 03
0310 85 20 A0 05 10 02 A0 00 A2 05 20 72 02 29 0F D5
0320 CA F0 F5 CA 10 F9 99 CA 00 B8 10 EC 20 B2 02 A0
0330 03 84 E1 B9 36 00 20 3F 02 9A 30 17 ED 03 30 04
0340 A9 19 10 0A ED 01 30 04 A9 0E 10 02 A9 00 A0 01
0350 20 00 02 C6 E1 A4 E1 10 DA A4 CA B9 E7 1F 35 0C
0360 A2 03 84 C6 B9 E7 1F 95 20 CA 10 F6 A0 00 95 20
0370 00 02 20 58 02 C9 14 F0 48 20 75 02 85 CA 8A 30
0380 EB A5 CA A2 04 D5 C1 F0 33 CA 10 F9 20 8F 02 8A
0390 30 9A ED 03 10 17 ED 01 10 1D A0 00 A9 26 20 00
03A0 02 20 99 02 C5 CA D0 84 A9 26 20 CF 02 A0 01 47 A9
03B0 3D 20 00 02 4C 16 03 A9 4F 20 CF 02 A9 65 20 CF
03C0 02 A0 00 A9 B7 20 00 02 20 58 02 20 C5 02 85 01
03D0 8A 30 EE A5 31 A6 ED 95 C0 C5 CB F0 15 C6 ED F0
03E0 1A A4 80 D9 E7 1F 85 9F A0 00 A9 90 20 00 02 4C
03F0 6C 03 A0 02 A9 DE 20 00 02 F0 F7 A9 73 20 CF 02

```

EDITORS NOTE: On the Bay Area TVT from The Byte Shop #2. Well, my friend TVT is up and running! Basically, it's a 32x16 display (a board to convert to a 64x16 display is available from other sources) that scrolls up after the screen is filled instead of going to another page. The memory, cursor control, and parallel interface are included on the main board instead of the usual plug-in arrangement. The pc board is definitely of industrial quality! Initial documentation was quite poor, but I understand from Bob Grater that it's been improved. The price of the TVT is 139.00 + 2.00 shipping from The Byte Shop #2, 3400 V. El Camino Real, Santa Clara, California 95051.

020E C9 00
0210 D0 01
0212 60
0213 95 E8

There is a slight bug in the travelling message program I sent you. It seems that the last character is displayed momentarily and then goes blank. Rearrange as follows. The WUMPUS program enclosed has it fixed the right way.

I have the assembly level listing of WUMPUS (haven't typed it though). It is so long that I thought the hex listing would suffice. There are a few things of interest like a random number generator (ala Sept. '76 Byte) in 0272-028E but mostly it is all WUMPUS. For those interested I'd be willing to send the assembly listing for a self-addressed stamped envelope. I'd also be willing to copy the program on tape for those furnishing a tape and return postage. (It's not really that long though and can be punched in fairly quickly).

I hope the User-Notes are coming along well. I can hardly wait.

.....

Stan

Looking at Tape

Jim Butterfield, Toronto

Program VUTAPE lets you actually see the contents of a KIM format tape as it's going by. It shows the data going by very quickly, because of the tape speed .. but you can at least 'sense' the kind of material on the tape.

In case of tape troubles, this should give you a hint as to the area of your problem: nothing? noise? dropouts? And you can prepare a test tape (see below) to check out the tape quality and your recorder. The test tape will also help you establish the best settings for your volume and tone controls.

Perhaps VU-TAPE's most useful function, though, is to give you a 'feeling' for how data is stored on tape. You can actually watch the processor trying to synchronise into the bit stream. Once it's synched, you'll see the characters rolling off the tape ... until an END or illegal character drops you back into the sync mode again. It's educational to watch. And since the program is fairly short, you should be able to trace out just how the processor tracks the input tape.

VUTAPE starts at location 0000 and is fully relocatable (so you can load it anywhere it fits).

KIM UTILITY: VU-TAPE

02

```

0000 D8      START  CLD
0001 A9 7F      LDA  #$7F
0003 9D 41 17   STA  PADD    set display dir reg
0006 A9 13      SYN      LDA  #$13    ..window 6 and tape in
0008 85 E0      STA  POINT    and keep pointer
000A 8D 42 17   STA  SBD
000D 20 41 1A   JSR  RDBIT    get a bit and
0010 46 F9      LSR  INH      ..slip it into
0012 05 F9      ORA  INH      ..the right-hand
0014 85 F9      STA  INH      ..side
0016 8D 40 17   STA  SAD      show bit flow on display
0019 C9 16      TST      CMP  #$16    ..is it a SYNC?
001B D0 E9      BNE  SYN      nope, keep 'em rolling
001D 20 24 1A   JSR  RDCHT    yup, start grabbing...
0020 C9 2A      CMP  #$2A    ..9 bits at a time and..
0022 D0 F5      BNE  TST      ..if it's not an '0'..
0024 A9 00      STREAM LDA  #$00    ..then start showing
0026 8D E9 17   STA  SAVX      ..characters 1 at a time
0029 20 24 1A   JSR  RDCHT
002C 20 00 1A   JSR  PACKT    ..converting to hexadec..
002F D0 D5      BNE  SYN      ..if legal
0031 A6 E0      LDX  POINT
0033 E8         INX
0034 E8         INX          Move along to next..
0035 E0 15      CPX  #$15      ..display position
0037 D0 02      BNE  OVER      (if last digit, ..
0039 A2 09      LDX  #$09      ..reset to first)
003B 86 E0      OVER  STX  POINT
003D 9E 42 17   STX  SBD
0040 AA         TAX          change character read
0041 BD E7 1F   LDA  TABLE,X ..to segments and..
0044 8D 40 17   STA  SAD      send to the display
0047 D0 DB      BNE  STREAM    unconditional jump

```

Checking Out Tapes/Recorders

Make a test tape containing an endless stream of SYNC characters with the following program:

```

0000 AD 0F      GO  LDI  #0F      direction..
0002 9C 43 17   STI  PHEAD    ..registers
0005 A9 16      LP  LDA  #016    SYNC
0007 8D 7A 19   JSR  DITCH    ..out to tape
000A D0 F9      BMT  LP

```

Now use program VUTAPE. The display should show a steady synchronization pattern. Try playing with your controls and see over what range the pattern stays locked in. The wider the range, the better your cassette/recorder.

SUPERTAPE WORKS GREAT!! HIGHLY RECOMMENDED

~the editor~

KIM-1 / TTY FIXIT MOD - from Ronald Kushnier, 310 Addison Ct., Cornwall Nts., Pa. 19020

The keyboard return from the TTY normally goes through a 150 ohm resistor (R49) to +5 volts. Disconnect the keyboard return lead from pin "R" on the applications connector and connect it through a 470 ohm 1/2 watt resistor to pin "W" (+12 vdc). Pin "W" is now used for both audio cassette interface and TTY when hooked to +12 vdc. This turned hopeless chatter into perfect copy. Now if I can only figure a way to get the teletype home from work...

SUPERTAPE!

Jim Butterfield
Toronto

How long does it take you to load a full 1K of KIM-1 memory? Over two minutes? And if you're going for memory expansion, how long will it take you to load your 8K? Twenty minutes?

Hold onto your hats. Program SUPERTAPE! will write fully compatible tapes in a fraction of the time. You can load a full 1K in 21 seconds.

Fully compatible means this: once you've written a tape using SUPERTAPE! you can read it back in using the normal KIM-1 program (starting at 1873 as usual). And the utilities and diagnostic programs work on this super-compressed data (e.g., DIRECTORY and VUTAPE).

You'll need some memory space for the program, of course. If you have memory expansion, there'll be no problem finding space, of course. But if you're on the basic KIM-1, as I am, you'll have to "squeeze in" SUPERTAPE! along with the program you're dumping to tape. I try to leave page 1 alone usually (the stack can overwrite your program due to bugs); so I stage SUPERTAPE! in that area. For the convenience of relocation, the listing underlines those addresses that will need changing. There are also four values needed in page zero which you may change to any convenient location.

For those interested in the theory of the thing, I should mention: SUPERTAPE! is not the limit. If you wished to abandon KIM-1 monitor compatibility, you could continue to speed up tape by a factor of 4 or 5 times more. (Can you imagine reading 1K in four seconds?). For the moment, however, SUPERTAPE! is plenty fast for me.

Thanks go to Julien Dube for his help in staging early versions of SUPERTAPE!

PRELIMINARY RESULTS OF SUPERTAPE TRIALS

So far, Supertape has been tried on a half-dozen or so cassette recorders, with mixed results. Three of them give solid input: never-fail loading. The other three work poorly or not at all.

The only common factor I can spot (don't have elaborate test facilities here) is cassette player output level - the good ones invariably blast out a fairly strong signal. In principle, level shouldn't matter; the first thing the signal hits on the KIM-1 board is a limiter which cuts off signals down to the same size.

For those who would like to improve their tape speed but can't get full speed Supertape to work on their cassettes, a change of two locations will give intermediate packing densities:

Name	Speed improvement	01BE	01CO
STANDARD	x 1	0C	12
FASTAPE	x 2	06	09
SPEEDTAPE	x 3	04	06
SUPERTAPE	x 6	02	03

Maybe we should start a catalogue of cassette recorder models and what speeds each will support.

PAGE 12

contd.....

KIM-1 SOFTWARE-

Robert Tripp, editor of THE KIM USERIST has put together a package of games, demo-programs and a real-time monitor to control the whole works on a cassette. It's available as a package (cassette, source listings & instructions) for \$10.00. It's called PLASSE. Runs on the basic KIM with no additional memory or I/O and sounds very interesting. It is available from Micro-Cosmos, 210 Cantel Webster Hwy. So., W. Nashua, N.H. 03060

KIM-1 SOFTWARE-

6502 Program Exchange, 2920 Moana Ln., Reno Nevada, 89509
(8-25 for program list.) Most programs were written for TIM & JOLT monitors, but easily converted to KIM by changing I/O subroutine calls. You need a TIM or JOLT. For -25 extra, order TIM (DECK) subroutine list and you will receive a list of 16 TIM routines and their effects to make conversion to KIM a lot easier. (and it's cheaper than buying a TIM manual).

SUFERTAFE!
October, 1976

Jim Butterfield
Toronto

0100 A9 AD	DUMET	LDA #3AD	op code LDA
0102 8D EC 17		STA VEB	
0105 20 32 19		JSR INTVEB	set up subrtm
0109 A9 27		LDA #327	
010A 95 E1		STA GANG	flag to go to SBD
010C A9 BF		LDA #3BF	
010E 8D 43 17		STA 1BDD	open the channels
0111 A2 64		LDX #364	send 100...
0113 A9 16		LDA #316	...SYNC chars
0115 20 61 01		JSR HIC	
0117 A9 2A		LDA #32A	send asterisk
011A 20 43 01		JSR OUTCHT	
011D AD F9 17		LDA 1D	then the 1D
0120 20 70 01		JSR OUTBT	
0123 AD FE 17		LDA SAL	followed by
0126 20 6D 01		JSR OUTBTC	the start address
0129 AD F3 17		LDA LAN	(low and high)
012C 20 6D 01		JSR OUTBTC	
012F 20 EC 17	DUMPT4	JSR VEB	get memory word
0132 20 6D 01		JSR OUTBTC	and send it
0135 20 EA 19		JSR INCVEB	on to next address
0138 AD E7 17		LDA VEB+1	
013B CD F7 17		CMF EAL	is the address..
013E AD EE 17		LDA VEB+2	..at the end?
0141 ED F4 17		SEC EAH	
0144 90 E9		BCC DUMPT4	no, go back;
0146 A9 2F		LDA #32F	yes, send end-data
0148 20 89 01		JSR OUTCHT	
014B AD E7 17		LDA CHKL	..and checksum
014E 20 70 01		JSR OUTBT	
0151 AD E9 17		LDA CHKH	..hi and low..
0154 20 70 01		JSR OUTBT	
0157 A2 02		LDX #302	send two..
0159 A9 04		LDA #304	EOT characters
015B 20 61 01		JSR HIC	
015E 4C 5C 15		JMF DISIZ	and we're finished
0161 96 E0		subroutines follow here	
0163 49	HIC	STX TIC	count
0164 20 93 01	HIC1	PHA	
0167 69		JSR OUTCHT	send character
0169 C6 E0		PLA	..and bring it back
016A D0 F7		DEC TIC	
016C 60		BNE HIC1	do it agin
		RTS	
016D 20 4C 19	OUTBTC	JSR CHKT	compute checksum
0170 49	OUTBT	PHA	save the character
0171 4A		LSR A	
0172 4A		LSR A	..and take its
0173 4A		LSR A	four left bits..
0174 4A		LSR A	
0175 20 7D 01		JSR HEXOUT	write 'em ...
0178 69		PLA	now the 4 right bits..
0179 20 7D 01		JSR HEXOUT	
017C 60		RTS	

PAGE 13

MORE.....

```

017D 29 0F      HEXOUT AND #$0F remove unwanted bits
017F C9 0A      CMP #$0A change to ASCII by..
0191 18         CLC adding:
0182 30 02      BMI HEX1
0184 69 07      ADC #$07 $37 if A to F
0186 69 30      HEX1 ADC #$30 $30 if numeric
0188 A0 08      OUTCHT LDY #$08 for the eight bits..
018A 84 E2      STY COUNT
018C A0 02      TRY LDY #$02 send 3 units
018E 94 E3      STY TRIB starting at 3600 hertz
0190 BE BE 01 ZON LDY NFUL,Y number of half cycles
0192 48         FHA keep the character
0194 2C 47 17 ZON1 BIT CLKRDI Wait for the previous..
0197 10 FB      BPL ZON1 . cycle to complete
0199 B9 BF 01 LDA TIMG,Y Ge the time to the..
019C 9D 44 17 STA CLK1T ..next pulse ($7E or C3)
019F A5 E1      LDA GANG
01A1 49 90      EOR #$90 Flip between 1 and 0
01A3 8D 42 17 STA SBD
01A6 95 E1      STA GANG
01A8 CA         DEX have we sent all the cycles?
01A9 D0 E9      BNE ZON1 nope, send another one
01AB 68         PLA get back the character
01AC C6 E3      DEC TRIB one less unit to send
01AE F0 05      BEQ SETZ and the last one's here
01B0 30 07      BMI ROUT none left? quit
01B2 4A         LSF A Take next bit
01B3 90 DB      BCC ZON ..and if it's a one..
01B5 A0 00      SETZ LDY #$00 switch to 2400 cycles/sec
01B7 F0 D7      BEQ ZON unconditional return
01B9 C6 E2      ROUT DEC COUNT one less bit
01BB D0 CF      BNE TRY any more? go back
01BD 60         RTS

; frequency/density controls
01BE 02      NFUL .BYTE $02 two pulses; one cycle!
01BF C3 03 7E TIMG .BYTE $C3,$03,$7E
end

```

.....

A Microcomputer Data Processing course, utilizing the KIM-1, will be held at Thames Valley State Technical College in Norwich, Connecticut. The course will consist of 22 evening sessions and will run from Dec. 6, 1976 thru Feb. 28, 1977. Contact Frank Rydzicki (203) 886-0177 for more information.

.....

SUBSCRIPTION INFORMATION

KIM-1 USER NOTES is published every 5 to 8 weeks. The subscription rate for U.S. and Canadian subscribers is \$5.00 for volume 1 issues 1 thru 6 including 1st class postage. Foreign subscriptions which includes Europe and S. America is \$8.00 including 1st class air mail postage.

Payment should be made in U.S. funds with a check or money order (no cash or purchase orders) please.

KIM-1 User Notes
c/o Eric H. Rebane
7636 Broadview Rd. #207
Parma, Ohio 44134

Robert L. Troup
8817 Prairie Ave.
Highland, Ind. 46322

James H. Van Ornum
55 Cornell Dr.
Hazlet, N. J. 07730

E. F. Vozenilek
Corning Glass Works
Sullivan Park
Corning, N. Y. 14830

Tim Walsh
174 E. Mauser
Valley Stream, N.Y. 11580

Leo J. Weeks
1351 16th Place
Yuma, Ariz. 85364

William D. Wurzel
102 Eastmoor Dr.
Silver Spring, Md. 20901

G. D. Young
Anderaa Instruments Ltd.
560 Alspa St. Victoria
British Columbia, Canada V8Z 1B2

John Zink Company
P.O. Box 7388
Tulsa, Okla. 74105

Dr. Robert C. Pickett
1403 N. Washington, Apt. #302
St. Peter, Minn. 56082

R. J. Kotalik
1152 Castlegate Lane
Santa Ana, Cal. 92705

The Pennsylvania State University
Office of the Burser
University Park, Pa. 16802

James L. Arbuckle
619 Argyle Ave.
Ambler, Pa. 19002

Phillip E. Fraley
1753 York Rd., Colony Park
Reading, Pa.

Matthew A. Treu
2928 S. 52nd St.
Milwaukee, Wisc. 53219

P. S. Tschang
883 Winona Blvd.
Rochester, N. Y. 14617

Paul J. Van Wle
10504 Ludlow
Huntington Woods, Mich. 48070

L. C. Verdun
Rowe International, Inc.
1500 Union Ave., S.E.
Grand Rapids, Mich. 49502

Phillip A. Vasson
9513 Hindry Place
Los Angeles, Cal. 90045

Peter Wells
Box 152
Rindge, N. H. 03461

Ralph Yamamoto
6701 DeSoto Ave. #337
Canoga Park, Ca. 91303

Steve Zimmerman
Teksel Inc.
300 Broad St.
Stamford, Conn. 06901

Steve Wash
6277 Bluff Acres Dr.
Greenwood, Ind. 46142

Whitmore Electronics Co.
410 N.W. 117th St.
Miami, Fla. 33168

Gary Schober
3 Price Drive
Edison, N. J. 08817

Peter Jennings
1612 - 43 Thorncliffe Pk. Dr.
Toronto, Ontario
Canada M6H 1J4

Richard W. Cael
250 Beverly Blvd. Apt. A-205
Upper Darby, Pa. 19082

Robert L. Libbey
1316 Beaverbrook Rd.
Cherry Hill, N. J. 08034

Robert A. Hill
2212 W. 36th
Pine Bluff, Ark. 71601

Harold P. Grace
108 No. Concord Ave.
Havertown, Pa. 19083

Francis J. Vastola
406 Hillcrest Ave.
State College, Pa. 16801

Ronald J. Vincent
95 White Bridge Rd.
Nashville, Tenn. 37205

Thomas O. Wear
380 Belaire Ct.
Punta Gorda, Fla. 33950

Francis D. Witninski
639 Blue Spruce Cr.
Webster, N. Y. 14580

Robert Zawislak
2009 W. Huron St.
Chicago, Ill. 60612

Jason M. Zinserling
Rte. #1, Box 583H
Toledo, Ore. 97391

Richard T. Berovec
1105 N. Harvey Ave.
Oak Park, Ill. 60302

Donald E. Scott
R.F.D. #3 Juggler Meadow Rd.
Amherst, Mass. 01002

Edward H. Stokes II
632 First Street
Woodland, Cal. 95695

Lee L. C. Sorensen
10226 Victoria Avenue
Whittier, Cal. 90604

Philip Ryan
P. O. Box 3656
Coos Bay, Ore. 97420

Larry Langendorf
416 Casa Del Mar Dr.
Half Moon Bay, Cal. 94019

William R. Deazley
1320 Blood Rd.
Conklesville, N. Y. 14037

Gregory D. Akers
2110 Newport Blvd. Apt. 11
Costa Mesa, Cal. 92627

Walter H. Babcock
4821 Hassan Circle, Apt. 5
Dayton, Ohio 45432

L. C. Becker
Physics Department
Hiram College
Hiram, Ohio 44234

Binks Res. & Development Corp.
1791 Range Street
Boulder, Colo. 80301

Herbert Blenner
37-62 95th St.
New York, N. Y. 11372

Robert M. Brodie
15 Harwich Road
Chestnut Hill, Mass. 02167

Ralph E. Bugg
8530 Beatty
Massillon, Ohio 44646

Frank Butler
194 Bon Aire
Iowa City, Iowa 52240

Jeff C. Campbell
10922 Roaring Brook
Houston, Tex. 77024

H. T. Cannon
1407 Boundary St.
Newberry, S. C. 29108

Eugene L. Caylor
R. R. No. 8, Box 143
Muncie, Indiana 47302

James Conragen
1002 The Dailies
Sunnyvale, California 94087

Rudy Correa
817 So. Brighton
Dallas, Tex. 75208

John Crossley
1555 Sonoma, No. 10
Sacramento, Cal. 95815

Roger W. Apts
206 Summer St
Norwell, Mass. 02061

A. Beato
Latin American Film Project Inc
215 West 90th Street 9C
New York, N. Y. 10024

D. M. Beetle
Publisher On-Line
24695 Santa Cruz Highway
Los Gatos, Calif. 95030

Per Bjorn
P.O. Box 309
Quakertown, N. J. 08860

Thomas Bray - Apt. #315
4201 Logangate Rd.
Youngstown, Ohio 44505

Charles E. Brown, Jr.
Route 1, Box 159-B1
White Stone, Va. 22578

Ralph W. Burhans
161 Grosvenor St.
Athens, Ohio 45701

F. J. Butterfield
14 Brooklyn Avenue
Toronto, Ontario
Canada M4M 2X5

John R. Campbell
6278 Lake Lucerne Drive
San Diego, Calif 92119

John Caramatti
123-22 Lax Ave.
College Point, N.Y., N.Y. 11356

William Ralph Champion
P. O. Box 45282
Dallas, Texas 75245

Kenneth Cook
14600 Oak Park Blvd.
Oak Park, Mich. 48237

Francis P. Crane
4832 W. Hutchinson
Chicago, Ill. 60641

Robert G. Culter
4816 S. W. Oleson Rd. - Apt. 8
Portland, Oregon 97225

G. W. Armerding
360 Fowling St.
Playa Del Rey, Cal. 90291

Edward J. Bechtel, M.D.
Park Lido Professional Bldg
351 Hospital Rd., Suite 210
Newport Beach, Cal. 92660

Charles Schell, MEd
Betz Labs., Inc.
Somerton Road
Traverse, Pa. 19047

John Blankenship
5458 Holloman Rd.
Powder Springs, Ga. 30073

H. P. Briar
10215 Malaga Way
Rancho Cordova, Cal. 95670

Dick Bruno
CERC - Kingman Bldg.
Ft. Belvoir, Va. 22060

Mrs. Ann Butler
3017 Arvida Circle
Mississauga, Ontario
Canada, L5N 1R6

Jay Smith
J. V. Calhoun Company
349 Montgomery Ave.
Bala Cynwyd, Pa. 19004

Michael J. Campbell
6131 Monterey Road
Los Angeles, Cal. 90042

Elmer A. Carlson
29170 S. Lake Shore Dr.
Agoura, Calif. 91301

R. A. Cole
9812 N.E. 14th
Bellevue, Wash. 98004

James L. Corbett
4550 Avenida Del Este
Yorba Linda, Cal. 92686

Hugh E. Criswell
Dept. of Psychology
Williams College
Williamstown, Ma. 01267

Currie, Peak & Frazier, Inc
P.O. Box 13229
Orlando, Fla. 32809

Christine A. Monson
1020 Florence Lane #15
Menlo Park, Cal. 94025

Gary J. Moors
2517 Dunks Ferry Rd., Apt. C-307
Cormell's Heights, Pa. 19020

Richard L. Morgan
8817 Merlin Dr.
Houston, Texas 77055

Jim Muehlen
73 Magazine
Peterborough, N. H. 03458

Nicholas W. Muller, Jr.
9235 Briar Crest Dr.
La Mesa, Cal. 92041

T. L. Myers
1142 Norby Lane
Fullerton, Cal. 92633

Daniel G. McCann
CKM Inc.
P.O. Box 9322
Wilmington, Del. 19809

John R. McClenon
712 Riverside Dr.
Lynchburg, Va. 24503

Lester L. McClure
8 North Avenue
Derby, Conn. 06418

Harold V. McIntosh
University of Florida
Williamson Hall
Gainesville, Fla. 32611

Vincent G. McGevna
8109 Delco Ave.
Canoga Park, Cal. 91306

Bob McCulla
20333-15 N.E. #28
Seattle, Wash. 98155

H. J. McKinley, Jr.
Engineering Systems Division
The University of Tulsa
600 So. College
Tulsa, Oklahoma 74104

S. Brooks McLane
Penn State University
104 Ovey Laboratory
University Park, Pa. 16802

Paul K. McLain
2620-31st West
Seattle, Wash. 98199

Nigel Nathan
12 Stoneholm St., #323
Boston, Maine 02115

Steve Nabers
648 Covington Ave.
Glen Burnie, Md. 21061

Gary W. Nelson
4009 W. Redfield Rd.
Phoenix, Ariz. 85023

Ron Niessen
2-156 First Ave.
Ottawa, Ontario, Can. K1S 2G4

Franc E. Noel
28 B River Terrace
Poughkeepsie, N.Y. 12601

E. R. Oates
2345 W. Mockingbird
Dallas, Texas 75235

Michael A. Neighbors
B-K Dynamics, Inc.
200 West Court Sq., Suite 908, CBB
Huntsville, Ala. 35801

William E. O'Connor
W. E. O'Connor Laboratories
Box 385
Bayville, N. J. 08721

Jerry O'Brien
1628 4th St., N.
South St. Paul, Minn. 55075

Jim Overstreet WA5QXP
Electronic Systems Corp.
228 Coolidge St.
New Orleans, La. 70121

Stanley T. Ockers
R. R. #4, Box 209
Lockport, Ill. 60441

William S. Page
23 Old Manor Rd.
Newark, Del. 19711

Allen Penn, President
Sylvan Hills Laboratory, Inc.
#1 Sylvanway, Box 239
Strafford, Mo. 65757

Charles H. Parsons
80 Longview Rd.
Monroe, Conn. 06468

C. S. Pepper
4281 Avati Dr.
San Diego, Cal. 92117

Spencer R. Persik
71 Woodridge Trail
Henrietta, N. Y. 14467

Don Peterson
805 N. Oak Drive
White Bear Lake, Minn. 55110

Richard A. Peterson
9004-184th Ave. E.
Sumner, Wash. 98390

Phillip J. Pietraszewski
Eng. Lab. - Dept. 60
Dodge Mfg., Div. of Reliance
500 S. Union
Mishawaka, Inc. 46544

Don Pezzolo
22811-A Medina Lane
Cupertino, Cal. 95014

Mark Piasecki
5059 Walnut Park Dr.
Santa Barbara, Cal. 93111

Clifton W. Pittelkau
Rt. 1, Bethel Academy
Warrenton, Va. 22186

Jesse Platts, Physics Dept.
El Camino College
Torrance, Cal. 90506

PMI, Inc.
596 Sherwood Avenue
Satellite Beach, Florida 32937

Prof. W. Klein
Electrical Technology Dept. RM8-140
The College of Staten Island
715 Ocean Terrace
Staten Island, N.Y. 10301

Irving Johnson
276 Woodstock
Clarendon Hills, Ill. 60514

Robert E. Maas
2288 Blackburn St.
Eugene, Ore. 97505

John D. Howard
2916 Sunnymede Ct.
Topeka, Kansas 66611

Will C. Bunnell
1515 S. Jefferson Davis Hwy.
North 1013W
Arlington, Va. 22202

Petr Sehnal
W. Regional Applications Mgr.
MOS Technology, Inc.
22300 Foothill Blvd. Suite 311
Hayward, Cal. 94541

Editor
San Diego Computer Society
Box 9988
San Diego, Cal. 92109

Debbie Hopkins
PACC
430 College Park Dr.
Monroeville, Penna. 15146

Larry Steckler, Editor
Radio Electronics
200 Park Ave. South
New York, N. Y. 10003

The University of Tulsa
600 South College
Tulsa, Okla. 74104

J. J. Dube, Apt. 4901
44 Charles St. West
Toronto, Ontario M4Y 1R5
Canada

Intelligent Systems, Inc.
4134 Linden Ave., Suite 305
Dayton, Ohio 45432

J. C. Williams
Materials
Rensselaer Polytechnic Inst.
Troy, New York 12181

Earl Hammond
Universal Engineering
Frankenmuth, Mich. 48734

Dr. Lawrence A. Ezard
2149 Kentwood Dr.
Lancaster, Penna. 17601

C. J. Munsey
9077 Westhill Rd.
Lakeside, Cal. 92040

J. S. Green
807 Bridge St.
Bethlehem, Pa. 18017

Philip B. Mollander, Ph.D.
The Ohio State University
College of Medicine
Department of Pharmacology
1645 Neil Avenue
Columbus, Ohio 43210

M. P. Asar
111 West Hudson Street
Apt. 2K
Columbus, Ohio 43202

Jim Warren Jr.
Dr. Dobbs Journal
Box 3010
Palo Alto, Ca. 94305

Richard M. Bender
R.D. #1
Box 76
Ebensburg, Pa. 15931

Wm. L. Young
2533 Garfield Ave. So.
Minneapolis, Minn. 55405

M. Morell
The Data Center
136 M. Maryland Ave.
Glendale, Cal. 91206

Don C. DeGregori
10526 Orion Ave.
Mission Hill, Cal. 91345

Northwest Computer Club
P.O. Box 5304
Seattle, Wash. 98105

Robert V. Grater
Microfit Systems
1595-21 Laurelwood Rd.
Santa Clara, Cal. 95050

Mr. E. V. Olsen W6PWS
5115 Silverado Trail
Mesa, Cal. 94558

Wayne G. Van Zandt
70 West Shawnee Trail
Wharton, N. J. 07885

J. C. Electronics ApS.
P.O. Box 49
DK-2980 Kokkedal
Denmark

John P. Lamson
Magnetic Specialties, Inc.
10 Albemarle Ave.
Ewing Twp.
Trenton, N. J. 08638

Larl Helmers
BYTE
70 Main Street
Peterborough, N. H. 03458

Ellis D. Cooper
C-K Algorithm
323 West 14th St.
New York, N. Y. 10014

Robert A. Moore
317 Shawnee
Park Forest, Ill. 60466

Jodie S. Hobson
1104 N. Overhill Ct.
Wilmington, Dela. 19810

Edward Voigtman
592 Leigh Hall
Dept. of Chemistry
University of Florida
Gainesville, Fla. 32604

William O. Cope, Apt. 39-D
1900 So. Charles St.
Greenville, N. C. 27834

Eduardo Kellerman
1047 Schuyler Drive
Endicott, N. Y. 13760

V. L. Kimball
1688 Green Valley Dr.
Dayton, Ohio 45432

Stanley Klein
Joint Science Dept.
Claremont College
Claremont, Cal. 91711

R. L. Kurtz
74 Santa Bella Rd.
Rolling Hills, Cal. 90274

Phillip K. Landis
220 Greenway Ave.
Satellite Beach, Fla. 32937

Paul C. Laughton
Service Bureau Company
700 W. Hamilton Ave.
Campbell, Cal. 95008

Eliyu Lesser
Box 308
Spencer, Maine 01562

Klaus G. Liebholt
7028 Buxton Terrace
Bethesda, Maryland 20034

Tod Loofbourrow
815 Standish Ave.
Westfield, N. J. 07090

Gerald V. Lucha
3749 Ross Rd.
Palo Alto, Cal. 94303

Thomas H. Lynch
8019 Sale Ave.
Canoga Park, Cal. 91304

R. E. Malcho
2831 Bayview Dr.
Corona Del Mar, Cal. 92624

Bob Mayer
5520 East Drive
Everett, Wa. 98203

Tibor L. Mikecsy
208 H. Overmount Ave.
West Patterson, N. J. 07424

Charles Kiessling
P. O. Box 539
Endicott, N. Y. 13760

Dustin C. King
1170 Glen Creek, N.W.
Salem, Ore. 97304

George Klose
1207 Amethyst, Apt. A
Redondo Beach, Cal. 90277

Bill Kwin
3308 South Duff #30
Ames, Iowa 50010

Gordon E. Latte
1658 Brandywine Dr.
Charlottesville, Va. 22901

Paul D. Law
1487 East 19th St.
Brooklyn, N. Y. 11230

Cass R. Lewart
12 Georjean Dr.
Holmdel, N. J. 07733

Robert G. Lloyd
7554 Southgate Rd.
Fayetteville, N. C. 28304

Robert P. Lothrop
1720 N. Broad
Meriden, Conn. 06450

Ann Luffman
2122 Pinetree Ct.
Rancho Cordova, Cal. 95670

Christopher J. Mack
25 S. 10th St.
Allentown, Penna. 18102

Aaron J. Martin
R. D. #3, Box 116
Kennett Square, Penna. 19348

Andrew Mazur, Jr.
806 Ridge Lane
Media, Penna. 19063

Frederick H. Miller
7 Templar Way
Parsippany, N. J. 07054

Anthony R. Kildare
5315 N. Allen Place
Spokane, Wash. 99208

Klaus Fritsch
John Carroll University
20700 North Park Blvd.
University Heights, Ohio 44118

Robert M. Kuhns
303 Penwood Rd.
Silver Spring, Md. 20901

James O. Lamb
10861 Northforde Dr.
Cupertino, Cal. 95014

Joseph S. Laughter, Jr.
4095 Halliburton
Memphis, Tenn. 38128

Ronald Lee
439 Vine St.
Reno, Nev. 89503

Donald R. Lewis, Jr.
2920 N. Armistead Ave., Lot 14
Hampton, Va. 23666

Kent O. Loobey
1300 Quaker St., Apt. #26
Eugene, Oregon 97402

Stuart E. Lovell
5221 E. Rosewood
Tucson, Ariz. 85711

Richard W. Lutz
122 Carol St.
Chapel Hill, N. C. 27514

Clifford Major
599 Foch Blvd.
Williston Park, N.Y. 11596

Richard Maus
14130 40th Ave., No.
Minneapolis, Minn. 55441

Mechanical Design
1930 S.E. Stone St.
Corvallis, Ore. 97330

Norm Milliard
Pocket Music
P. O. Box 71
Stafford Springs, Conn. 06076